

Mutations

Mutations Show up as a Strange New Characteristic

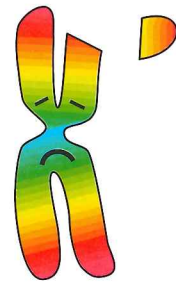
- 1) A **MUTATION** occurs when an organism develops with some **strange new characteristic** that no other member of the species has had before.
- 2) For example if someone was born with blue hair it would be caused by a mutation.
- 3) Some mutations are beneficial, but **most are disastrous** (e.g. blue hair).



Mutations are Caused by Faults in Genes and Chromosomes

There are **several ways** that mutations happen, but in the end they're all down to **faulty genes**. Mutations **usually happen** when the chromosomes are **replicating themselves** and something goes wrong.

O-Oh!



There are three ways of saying what a mutation is:

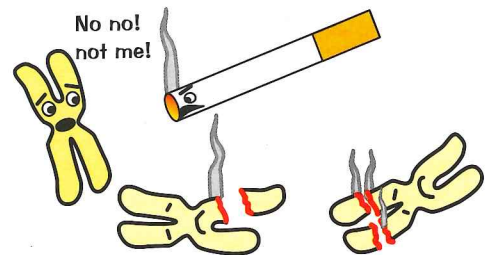
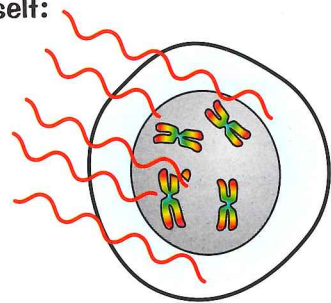
- 1) A mutation is a **CHANGE TO A GENE** or several genes.
- 2) A mutation is a **CHANGE** in one or more **CHROMOSOMES**.
- 3) A mutation **STARTS IN THE NUCLEUS** of one particular cell.

Radiation and Certain Chemicals cause Mutations

Mutations occur "naturally", probably caused by "natural" background radiation (from the sun and rocks etc.) or just the laws of chance that every now and then a chromosome doesn't quite copy itself properly.

However **the chance of mutation is increased** by exposing yourself:

- 1) To **nuclear radiation**, i.e. alpha, beta and gamma radiation.
This is sometimes called **ionising radiation** because it creates ions (charged particles) as it passes through stuff.
(See the Physics Book.)
- 2) To **X-rays** and **Ultra-Violet light**, which are the **highest-frequency** parts of the **EM spectrum** (together with **gamma rays**).
- 3) To certain **chemicals** which are known to cause mutations.
Such chemicals are called **mutagens**! If the mutations produce cancer then the chemicals are often called **carcinogens**.
- 4) **Cigarette smoke** contains **chemical mutagens** (or **carcinogens**)... (I'm sayin' nowt — See P. 47.)



Don't get your genes in a twist, this stuff's easy...

There are three sections with numbered points for each. **Memorise** the headings and learn the numbered points, then **cover the page** and **scribble down** everything you can remember. I know it makes your head hurt, but every time you try to remember the stuff, the more it sinks in. It'll all be worth it in the end. **Smile and enjoy.**

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Most Mutations are Harmful

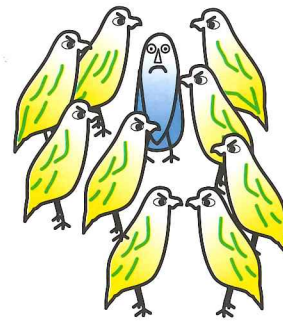
If a mutation occurs in reproductive cells, then the young may develop abnormally or die at an early stage of their development.

Mutations Often Cause Cancer

If a mutation occurs in body cells, the mutant cells may start to multiply in an uncontrolled way and invade other parts of the body. This is what we know as CANCER.

Some Mutations are Beneficial, giving us "EVOLUTION"

- 1) Blue "budgies" appeared suddenly as a mutation amongst yellow budgies. This is a good example of a neutral effect. It didn't harm its chances of survival and so it flourished (and at one stage, every grandma in Britain had one).
- 2) Very occasionally, a mutation will give the organism a survival advantage over its relatives, and it may well live on in conditions where the others die. This is natural selection and evolution at work.
- 3) A good example is a mutation in a bacteria that makes it resistant to antibiotics, so the mutant gene lives on, in the offspring, creating a resistant "strain" of bacteria, which antibiotics will not kill. We then have to develop a new antibiotic to deal with the new resistant strain of bacteria. And so it goes on.



Down's Syndrome is Caused by Having Three No. 21s

This is a completely different type of genetic disease where a person ends up with THREE CHROMOSOME 21s in their cells.

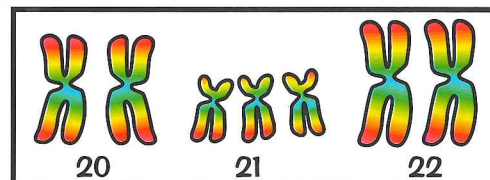
Down's Syndrome is actually an example of a MUTATION. It is unlike most mutations which involve changes to genes. This one just involves having an EXTRA CHROMOSOME.

The problem happens in one of the woman's ovaries. Occasionally BOTH chromosome 21s go into the same egg cell, leaving the other with none. If the egg with two chromosome 21s is fertilised the resulting offspring will have THREE chromosome 21s.

This causes Down's Syndrome.

The main effects of Down's Syndrome are:

- a) The child will have lower mental ability.
- b) They are also generally more susceptible to certain diseases.
- c) They tend to die quite young, around the age of thirty.



Learn the facts then see what you know...

There are three sections on this page, with several numbered points in each. You need to learn all these details about the harmful effects of mutations, including Down's Syndrome. When you think you know it all, cover the page and scribble it all down again. Then check back and see what important points you missed. Remember, they could ask any of this stuff.